

WE CLAIM:

1. An Orthogonal Frequency Division Multiplexed (OFDM) Base Transceiver Station (BTS) arranged to communicate with a plurality of mobile terminals within a coverage area including at least one target mobile terminal, the BTS comprising:

a processing apparatus that operates to receive and process service and data traffic information; and

a transmission apparatus that operates to receive the processed service and data traffic information, to transmit the processed service information on a first set of carriers to the mobile terminals within the coverage area with at least one first transmission beam and to transmit the processed data traffic information on a second set of carriers to the target mobile terminal on at least one second transmission beam, the second transmission beam being a directional transmission beam.

2. An OFDM BTS according to claim 1, wherein the service information comprises pilot information and signalling information.

3. An OFDM BTS according to claim 1, wherein the data traffic information comprises data traffic pilot information.

4. An OFDM BTS according to claim 1, wherein the first transmission beam is sufficiently broad for each of the mobile terminals within the coverage area to receive the processed service information.

5. An OFDM BTS according to claim 4, wherein the transmission apparatus comprises at least one first transmission beam output path, the first transmission beam

output path comprising a transmitter coupled to the processing apparatus and an antenna coupled to the transmitter; and

wherein the first transmission beam output path
5 receives the processed service information from the processing apparatus and operates to generate the first transmission beam.

6. An OFDM BTS according to claim 5, wherein the transmission apparatus comprises a plurality of first
10 transmission beam output paths, each of the first transmission beam output paths comprising a transmitter coupled to the processing apparatus and a directional antenna coupled to its respective transmitter; and

wherein each of the first transmission beam output
15 paths receives the processed service information from the processing apparatus and operates to generate a portion of the first transmission beam, each of the portions of the first transmission beam being focussed on a portion of the coverage area.

20 7. An OFDM BTS according to claim 5, wherein the transmission apparatus further comprises a plurality of second transmission beam output paths, each of the second transmission beam output paths comprising a phase adjuster coupled to the processing apparatus and further coupled in
25 series with a transmitter and an antenna; and

wherein the second transmission beam output paths each receive the processed data traffic information from the processing apparatus and operate together to generate the directional second transmission beam by selectively adjusting
30 their respective phase adjusters.

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8. An OFDM BTS according to claim 7, wherein the first transmission beam output path and one of the second transmission beam output paths share a common transmitter and antenna; and

5 wherein the shared transmitter receives the processed service information from the processing apparatus and receives phase adjusted data traffic information from the output of the phase adjuster within the particular second transmission beam output path.

10 9. An OFDM BTS according to claim 5, wherein the transmission apparatus further comprises a switch coupled to the processing apparatus and a plurality of second transmission beam output paths coupled to the switch, each of the second transmission beam output paths comprising a transmitter coupled to the switch and a directional antenna coupled to its corresponding transmitter; and

15 wherein the switch receives the processed data traffic information from the processing apparatus and selectively forwards the processed data traffic information to a set of the second transmission beam output paths to generate the directional second transmission beam.

20 10. An OFDM BTS according to claim 9, wherein the set of the second transmission beam output paths to generate the directional second transmission beam comprises one second transmission beam output path.

25 11. An OFDM BTS according to claim 5, wherein the transmission apparatus further comprises a second transmission beam transmitter coupled to the processing apparatus, a switch coupled to the second transmission beam

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transmitter and a plurality of second transmission beam directional antennas coupled to the switch; and

wherein the switch receives the processed data traffic information from the second transmission beam transmitter and selectively forwards the processed data traffic information to a set of the second transmission beam directional antennas to generate the directional second transmission beam.

12. An OFDM BTS according to claim 11, wherein the set of the second transmission beam directional antennas to generate the directional second transmission beam comprises one second transmission beam directional antenna.

13. An OFDM BTS according to claim 1, wherein the first transmission beam is a directional transmission beam; and

wherein the BTS is operable to modify the direction of focus of the directional first transmission beam in order for each of the mobile terminals within the coverage area to receive the processed service information.

14. An OFDM BTS according to claim 13, wherein the BTS modifies the direction of focus of the directional first transmission beam such that each of the mobile terminals within the coverage area is focussed by the directional first transmission beam for a corresponding time period in a repetitive fashion.

15. An OFDM BTS according to claim 13, wherein the transmission apparatus comprises a plurality of first transmission beam output paths, each of the first transmission beam output paths comprising a phase adjuster coupled to the processing apparatus and further coupled in series with a transmitter and an antenna; and

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wherein the first transmission beam output paths each receive the processed service information from the processing apparatus and operate together to generate the directional first transmission beam by selectively adjusting their respective phase adjusters.

16. An OFDM BTS according to claim 15, wherein the transmission apparatus further comprises a plurality of second transmission beam output paths, each of the second transmission beam output paths comprising a phase adjuster coupled to the processing apparatus and further coupled in series with a transmitter and an antenna; and

wherein the second transmission beam output paths each receive the processed data traffic information from the processing apparatus and operate together to generate the directional second transmission beam by selectively adjusting their respective phase adjusters.

17. An OFDM BTS according to claim 16, wherein at least one of the first transmission beam output paths and at least one of the second transmission beam output paths share a common transmitter and antenna; and

wherein the shared transmitter operates to receive phase adjusted service information from the output of the phase adjuster within the at least one first transmission beam output path and to receive phase adjusted data traffic information from the output of the phase adjuster within the at least one second transmission beam output path.

18. An OFDM BTS according to claim 13, wherein the transmission apparatus comprises a plurality of output paths, each output path comprising a first transmission beam phase adjuster coupled to the processing apparatus, a second

0934218-042601

transmission beam phase adjuster coupled to the processing apparatus, a transmitter coupled to both its respective first and second phase adjusters and an antenna coupled to its respective transmitter;

5 wherein the output paths each receive the processed
service information from the processing apparatus at their
respective first transmission beam phase adjusters and the
output paths operate together to generate the directional
first transmission beam by selectively adjusting their
10 respective first transmission beam phase adjusters; and

wherein the output paths each receive the processed data traffic information from the processing apparatus at their respective second transmission beam phase adjusters and the output paths operate together to generate the directional second transmission beam by selectively adjusting their respective second transmission beam phase adjusters.

19. An OFDM BTS according to claim 13, wherein the transmission apparatus comprises a first transmission beam switch coupled to the processing apparatus and a plurality of first transmission beam output paths coupled to the first transmission beam switch, each of the first transmission beam output paths comprising a transmitter coupled to the first transmission beam switch and a directional antenna coupled to its corresponding transmitter; and

25 wherein the first transmission beam switch receives
the processed service information from the processing
apparatus and selectively forwards the processed service
information to a set of the first transmission beam output
paths to generate the directional first transmission beam.

30 20. An OFDM BTS according to claim 19, wherein the
transmission apparatus further comprises a second

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transmission beam switch coupled to the processing apparatus and a plurality of second transmission beam output paths coupled to the second transmission beam switch, each of the second transmission beam output paths comprising a
5 transmitter coupled to the second transmission beam switch and a directional antenna coupled to its corresponding transmitter; and

wherein the second transmission beam switch receives the processed data traffic information from the
10 processing apparatus and selectively forwards the processed data traffic information to a set of the second transmission beam output paths to generate the directional second transmission beam.

21. An OFDM BTS according to claim 20, wherein the set
15 of the first transmission beam output paths in which the first transmission beam switch forwards the processed service information comprises one first transmission beam output path and the set of the second transmission beam output paths in which the second transmission beam switch forwards the
20 processed data traffic information comprises one second transmission beam output path.

22. An OFDM BTS according to claim 20, wherein at least
one of the first transmission beam output paths and at least one of the second transmission beam output paths share a
25 common transmitter and directional antenna; and

wherein the shared transmitter is operable to receive the processed service information from the first transmission beam switch and to receive the processed data traffic information from the second transmission beam switch.

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23. An OFDM BTS according to claim 13, wherein the transmission apparatus comprises a first transmission beam switch, a second transmission beam switch and a plurality of output paths, each output path comprising a transmitter
5 coupled to both the first and second transmission beam switches and an antenna coupled to its respective transmitter; and

wherein the first transmission beam switch receives the processed service information from the processing
10 apparatus and selectively forwards the processed service information to a set of the output paths to generate the directional first transmission beam and the second transmission beam switch receives the processed data traffic information from the processing apparatus and selectively
15 forwards the processed data traffic information to a set of the output paths to generate the directional second transmission beam.

24. An OFDM BTS according to claim 1 further comprising at least one Peak-Average-Power Ratio (PAPR) block coupled
20 between the processing apparatus and the transmission apparatus, the PAPR block operating to reduce peak power of the processed service and data traffic information.

25. An OFDM BTS according to claim 1, wherein the processing apparatus comprises at least one data traffic and service information processor that operates to receive and
25 process data traffic and service information and an inverse fast fourier transform block coupled between the data traffic and service information processor and the transmission apparatus.

30 26. An OFDM BTS according to claim 25, wherein the at least one data traffic and service information processor

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comprises a data traffic information processor, a signalling information processor and a pilot information processor; and

wherein each of the data traffic, signalling and pilot information processors perform at least one of modulation mapping, interleaving, rate matching, forward error correction encoding on the data traffic, signalling and pilot information respectively.

27. An OFDM BTS according to claim 1, wherein the transmission apparatus operates to transmit the processed service information with a plurality of transmission beams.

28. An OFDM BTS according to claim 27, wherein the transmission apparatus operates to transmit the processed service information with at least one signalling information transmission beam and at least one pilot information transmission beam.

29. An OFDM BTS according to claim 1, wherein the transmission apparatus operates to transmit the processed data traffic information with a plurality of transmission beams.

30. An OFDM BTS according to claim 29, wherein the transmission apparatus operates to transmit the processed data traffic information with at least one audio traffic information transmission beam and at least one non-audio traffic information transmission beam.

31. An OFDM BTS according to claim 29, wherein the transmission apparatus operates to transmit the processed data traffic information with at least one audio traffic information transmission beam and at least one video traffic information transmission beam.

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32. An Orthogonal Frequency Division Multiplexed (OFDM) Base Transceiver Station (BTS) arranged to communicate with a plurality of mobile terminals within a coverage area, the BTS comprising:

5 a processing apparatus that operates to receive and
process service and data traffic information; and

a transmission apparatus that operates to receive the processed service and data traffic information, to transmit the processed service information on a first set of carriers and the processed data traffic information on a second set of carriers using a directional transmission beam;

wherein the BTS is operable to modify the direction of focus of the directional transmission beam in order for each of the mobile terminals within the coverage area to receive the processed service information.

33. An OFDM BTS according to claim 32, wherein the service information comprises pilot information and signalling information.

34. An OFDM BTS according to claim 32, wherein the BTS
20 modifies the direction of focus of the directional
transmission beam such that each of the mobile terminals
within the coverage area is focussed by the directional beam
for a corresponding time period in a repetitive fashion.

35. An OFDM BTS according to claim 32, wherein the
25 transmission apparatus comprises a plurality of output paths,
each of the output paths comprising a phase adjuster coupled
to the processing apparatus and further coupled in series
with a transmitter and an antenna; and

wherein the output paths each receive the processed service and data traffic information from the processing apparatus and operate together to generate the directional transmission beam by selectively adjusting their respective phase adjusters.

36. An OFDM BTS according to claim 32, wherein the transmission apparatus comprises a switch coupled to the processing apparatus and a plurality of output paths coupled to the switch, each of the output paths comprising a transmitter coupled to the switch and a directional antenna coupled to its corresponding transmitter; and

wherein the switch receives the processed service and data traffic information from the processing apparatus and selectively forwards the information to a set of the output paths to generate the directional transmission beam.

37. An OFDM BTS according to claim 36, wherein the set of the output paths in which the switch forwards the information comprises one output path.

38. An OFDM BTS according to claim 32, wherein the transmission apparatus comprises a transmitter coupled to the processing apparatus, a switch coupled to the transmitter and a plurality of directional antennas coupled to the switch; and

wherein the switch receives the processed service and data traffic information from the transmitter and selectively forwards the information to a set of the directional antennas to generate the directional transmission beam.

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39. An OFDM BTS according to claim 38, wherein the set of the directional antennas in which the switch forwards the information comprises one directional antenna.

40. An OFDM BTS according to claim 32 further comprising at least one Peak-Average-Power Ratio (PAPR) block coupled between the processing apparatus and the transmission apparatus, the PAPR block operating to reduce peak power of the processed service and data traffic information.

41. An OFDM BTS according to claim 32, wherein the processing apparatus comprises at least one data traffic and service information processor that operates to receive and process data traffic and service information and an inverse fast fourier transform block coupled between the data traffic and service information processor and the transmission apparatus.

42. An OFDM BTS according to claim 41, wherein the at least one data traffic and service information processor comprises a data traffic information processor, a signalling information processor and a pilot information processor; and

wherein each of the data traffic, signalling and pilot information processors perform at least one of modulation mapping, interleaving, rate matching, forward error correction encoding on the data traffic, signalling and pilot information respectively.

43. A Base Transceiver Station (BTS) arranged to communicate with a plurality of mobile terminals within a coverage area, the BTS comprising:

means for receiving service and data traffic information;

means for transmitting the service information on a first set of carriers to the mobile terminals within the coverage area; and

means for transmitting the data traffic information with high link gain on a second set of carriers to the target mobile terminal.

44. A method of transmitting service and data traffic information to a plurality of mobile terminals within a coverage area, at least one of the mobile terminals being a target mobile terminal, the method comprising:

receiving service and data traffic information;

transmitting the service information on a first set of carriers to the mobile terminals within the coverage area using a first transmission beam; and

transmitting the data traffic information on a second set of carriers to the target mobile terminal using a second transmission beam.

45. A method of transmitting service and data traffic information to a plurality of mobile terminals within a coverage area, at least one of the mobile terminals being a target mobile terminal, the method comprising:

receiving service and data traffic information;

transmitting the service information on a first set of carriers to the mobile terminals within the coverage area with a directional transmission beam;

transmitting the data traffic information on a second set of carriers to the target mobile terminal with the directional transmission beam; and

2025 RELEASE UNDER E.O. 14176

modifying the direction of focus of the directional transmission beam in order for each of the mobile terminals within the coverage area to receive the processed service information.

- 5 46. A radio system comprising an Orthogonal Frequency Division Multiplexed (OFDM) Base Transceiver Station (BTS) and a plurality of mobile terminals within a coverage area of the BTS, at least one of the mobile terminals being a target mobile terminal;

10 wherein the OFDM BTS is operable to receive service and data traffic information, to transmit the service information on a first set of carriers to the mobile terminals within the coverage area with a first transmission beam and to transmit the data traffic information on a second set of carriers to the target mobile terminal with a second transmission beam, the second transmission beam being a directional transmission beam.

- 15 47. A mobile terminal arranged to communicate with a Base Transceiver Station (BTS), the mobile terminal comprising:
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a radio reception apparatus that operates to receive and process service information on a first set of carriers from at least one first transmission beam and to receive and process data traffic information on a second set of carriers from at least one second transmission beam; and

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a monitor apparatus, coupled to the radio reception apparatus, that operates to determine if one or more of service information and data traffic information has been received at the radio reception apparatus; if only service information has been received, to instruct the BTS to attend

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to the received service information; if only data traffic information has been received, to instruct the BTS to attend to the received data traffic information; and if service and data traffic information has been received, to instruct the

5 BTS to attend to both the received service and data traffic information.

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